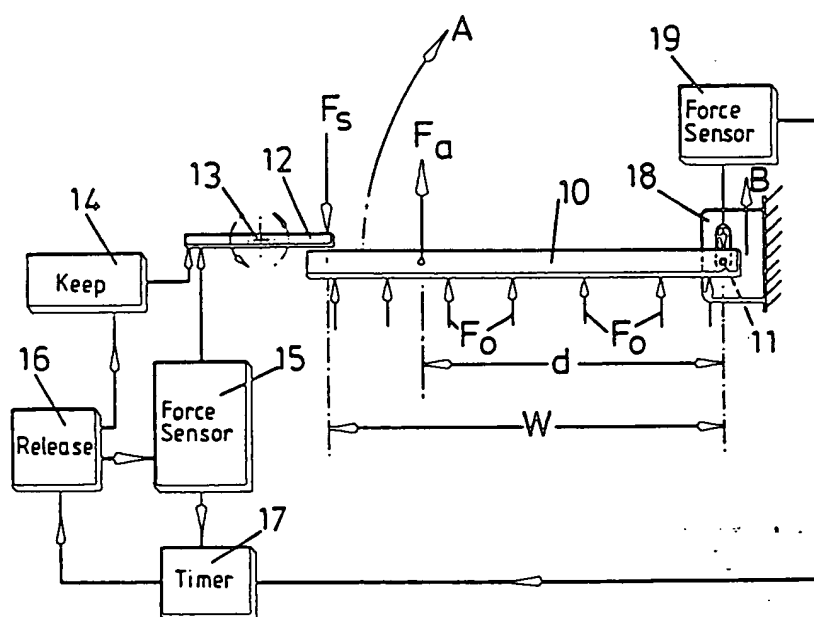


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(54) Title: BARRIER AUTOMATIC RELEASE MECHANISM



(57) Abstract

A releasable barrier (10) is arranged to swing about an upright pivot (11) and engages a pressure/time-sensitive release mechanism operative to release the barrier (10) automatically when a predetermined pressure or force on the barrier has persisted for a predetermined time. The mentioned parameters are adjustable. The release mechanism incorporates pneumatic force sensors (21, 26) and a pneumatic keep (22), the latter being provided with higher pressure and/or larger piston area to prevent opening of the barrier (10) so long as the force sensors (21, 26) are depressed transiently within a predetermined time limit.

BARRIER AUTOMATIC RELEASE MECHANISM

This invention relates to release mechanisms and to releasable barriers.

The invention is concerned especially, but not exclusively, with release mechanisms for crowd-control barriers.

According to the present invention, there is provided a release mechanism comprising;

- a stop shiftable between closed and open positions,
- a releasable keep for keeping the stop in a closed position,

- a sensing means responsive to an opening force when such force acts on the stop,

- timing means associated with the sensing means for determining when a predetermined opening force has acted for a predetermined time,

- and release means responsive to the timing means and operable to release the keep.

Further, according to the present invention, there is provided a releasable barrier in combination with a release mechanism as aforesaid.

When a release mechanism as aforesaid is used to control a barrier, the barrier is released automatically only when a predetermined pressure on the barrier has persisted for a predetermined time. This arrangement thus effectively filters out unwanted releases associated with transient pressures at or above the predetermined pressure, but too brief to have significance for barrier release.

Preferably, the barrier is mounted to swing on an upright pivot axis at one end of the barrier, and the stop is cooperable with the opposite end of the barrier.

Preferably, the sensing means comprises force sensors one at each end of the barrier.

In the case where the sensing means comprises a single

force sensor at that end of a pivoted barrier which cooperates with the stop, then the predetermined opening force is effective to release the barrier only when such force acts at that end of the barrier; and the actual force to release the barrier tends towards infinity when the direction of such force approaches the condition of acting at the pivot end of the barrier. By providing force sensors at both ends of the barrier, the upper limit of the range of actual force values is reduced from infinity to twice the "predetermined" force value.

In the foregoing and throughout the following description and the appended claims, the term "end" is used in reference to one or other width-determining limits of a barrier.

Embodiments of the present invention will now be described, by way of example, with reference to the accompanying drawings in which:-

Fig. 1 is a diagrammatic representation of a releasable barrier in accordance with the present invention;

Fig. 2 is a partly-diagrammatic arrangement of a preferred embodiment of a release mechanism in accordance with the present invention;

Fig. 3 is a sectional plan view of a load-sensitive hinge/pivot arrangement for a barrier in accordance with the present invention; and

Fig. 4 is a sectional elevation on the line IV-IV in Fig. 3.

In Fig. 1 of the drawings, a barrier 10 is seen in plan view and is mounted to swing about an upright pivot axis at 11 and is controlled by stop 12 which is shiftable between open and closed positions by virtue of being pivoted on a stop axis 13. Thus, in Fig. 1, the stop 12 is shown in its closed position restrained by a releasable keep 14 and a force-sensing means 15. Forces acting to open the barrier 10 are represented by arrows F_0 in Fig.

1; and the average of these opening forces is represented by F_a acting on the barrier 10 at a distance d from the pivot 11. The width of the barrier 10 is represented by dimension W .

The stop force resisting opening of the barrier 10 is F_s .

The releasable keep 14 is operable by means of a release means 16 which, when operated, also influences the force-sensing means 15 to withdraw or otherwise enable the stop 12 to shift/pivot clear of the barrier 10 thus allowing same to open in the direction of arrow A in Fig. 1.

The force sensing means 15 is adjustable to have a variable yielding force at which the stop 12 will begin to pivot in reaction to opening forces acting on the barrier 10. However, the releasable keep 14 is an "on/off" device, that is the keep 14 is either in a condition to keep the stop 12 in a closed position, or in a released condition allowing the stop 12 to pivot to an open condition.

The force-sensing means 15 is associated with a timing means 17 which is adjustably operable to delay operation of the release 16. The time delay may be anything from a fraction of a second to several seconds or even minutes.

At the pivot 11, the barrier 10 is carried on a slotted plate 18 so that the barrier 10 is capable of yielding movement in the direction of arrow B. Also, a second force-sensor 19 is provided at the pivot 11 and constitutes an extension of the force-sensing means 15.

Using the symbols mentioned in the foregoing, the following algebraic expressions will be self-explanatory.

$$F_s.W = F_a.d$$

thus $F_a = F_s.W/d$

From these expressions, it can be seen that as d

decreases from a value equal to W the value of the average actual force F_a will approach infinity as d approaches zero. Also, it is obvious that the force F_a approaches the value F_s as the value of d approaches the value of W .

These considerations assume that the barrier 10 is not able to yield at the pivot 11, and there is no provision of the force sensor 19. However, by making the arrangement at the pivot 11 "load-sensitive", then the maximum value of F_a is limited to twice the value of F_s because the effective minimum value for d is $W/2$.

In Figs. 2 to 4 of the drawings, parts to which reference has been made already in Fig. 1, are given the reference numerals used in Fig. 1.

The stop 12 is pivotally mounted on a gate post 20 and is linked mechanically to a force-sensing means 15 in the form of a double-acting pneumatic actuator 21 which may be similar to that described in our co-pending UK Patent Application No. GB 2239272A published 26 June 1991.

Arranged beside the actuator 21, a releasable keep 14 is provided in the form of a single-acting pneumatic actuator 22 having a mechanical linkage with the actuator 21 and the stop 12.

The actuators 21 and 22 are associated with appropriate supply and control means 23 so that the actuator 21 can be operated to shift the stop 12 between its open and closed positions; and the actuator 22 can be operated to keep the stop 12 in its closed position.

The actuator 21 incorporates a piston-position sensor 24 which provides a signal when the piston of the actuator 21 has moved a distance G as shown in Fig. 2. Also, the mechanical linkage between the stop 12 and the actuator 22 includes a lost-motion gap having the dimension G .

The dimensions of the actuator 22 and/or settings within the controls 23 are such that the force required to depress the piston in the actuator 21 is much less than the force required to depress the piston in the actuator

22. The operating pressure of actuator 22 is higher than that of actuator 21 and/or the piston area of actuator 22 is greater than that of actuator 21. Thus, the actuator 22 keeps the stop 12 in a closed position although the stop 12 can yield to forces acting on the barrier 10 to some extent within the limit of the gap G on depression of the piston of actuator 21.

The controls 23 incorporate the release means 16 and timing means 17, the arrangement being such that if the piston in the actuator 21 reaches a position sensed by the position sensor 24 and is held in this position for a predetermined time then the controls 23 exhaust both actuators 21, 22 and reverse the operation of actuator 21 to move the stop 12 rapidly to its open condition.

In Figs. 3 and 4, a load-sensitive hinge arrangement for the barrier 10 is installed in a hollow post 25 to which the slotted carrier plate 18 is welded or secured by other conventional means. In this case, a pivot pin 11A for the barrier 10 is positioned centrally in a slot 18A to enable the assembly to be adapted for use with opening forces acting on either side of the barrier 10.

The force sensor 19 consists of a single-acting pneumatic actuator 26 provided with a piston position-sensor 27. The piston rod of the actuator 26 responds to movement of the pivot pin 11A by means of a relay lever 28 pivotally carried on an inner carrier plate 29. The outer end of the lever 28 has an open slot or fork to embrace the pivot pin 11A.

It will be seen by inspection of Figs. 3 and 4 that opening forces F_0 acting on the barrier 10 and sufficient to overcome the pressure set in the actuator 26 will cause shifting of the pivot pin 11A in the slot 18A and rotation of the lever 28 to depress the piston in the actuator 26; and when such depression equals the gap value G then the timer means 17 incorporated in the controls 23 will be initiated.

It will be understood that the action of the timing means 17 stops if the gap value G in either actuator 21, 26 is not maintained until the end of the predetermined time value.

As described in our aforesaid co-pending Patent Application No. GB2239272A, the release mechanism herein described may be duplicated at a number of barrier stations and connected into a loop or ring providing common pneumatic and electrical supplies.

In a modification of the arrangement shown in Fig. 1 or 2, within the scope of the present invention, the force-sensing means and the keep are arranged mechanically in series instead of in parallel. Thus, in a modified Fig. 2, the actuators 21, 22 would be arranged co-axially, and the piston rod of the actuator 21 extended through a sliding seal provided in the blind end of the actuator 21 and arranged for contact with the piston rod of actuator 22 after closing a gap G. In a further modification within the scope of the present invention, the actuator 22 and/or the actuator 26 is/are double-acting to ensure rapid change-over from closed to open conditions. Thus, in a further modified Fig. 2 and a modified Fig. 3, two-way conduits would extend between the top ends of the actuators 22, 26 and the controls 23.

CLAIMS

1. A release mechanism comprising a stop (12) shiftable between closed and open positions, a releasable keep (14) for keeping the stop (12) in a closed position; characterised by a sensing means (15) responsive to an opening force (Fo) when such force acts upon the stop (12), timing means (17) associated with the sensing means (15) for determining when a predetermined opening force has acted for a predetermined time and release means (16) responsive to the timing means (17) and operable to release the keep (14).

2. A release mechanism according to claim 1; characterised in that the sensing means (15) comprises a pneumatic actuator (21) supplied in use of the mechanism with pneumatic medium at relatively low pressure, and the keep (14) comprises a pneumatic actuator (22) supplied in use of the mechanism with pneumatic medium at relatively high pressure.

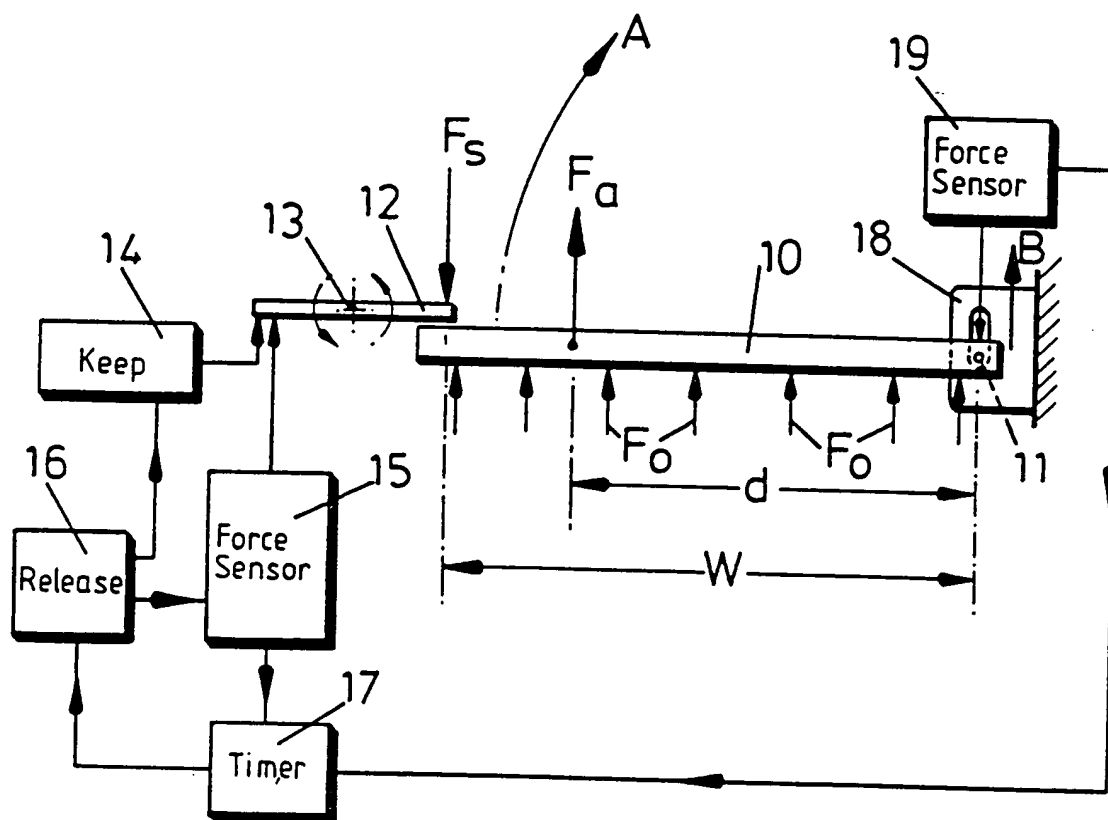
3. A release mechanism according to claim 1 or 2; characterised in that the sensing means (15) comprises a pneumatic actuator (21) having a relatively small piston area, and in that the keep (14) comprises a pneumatic actuator (22) having a relatively large piston area.

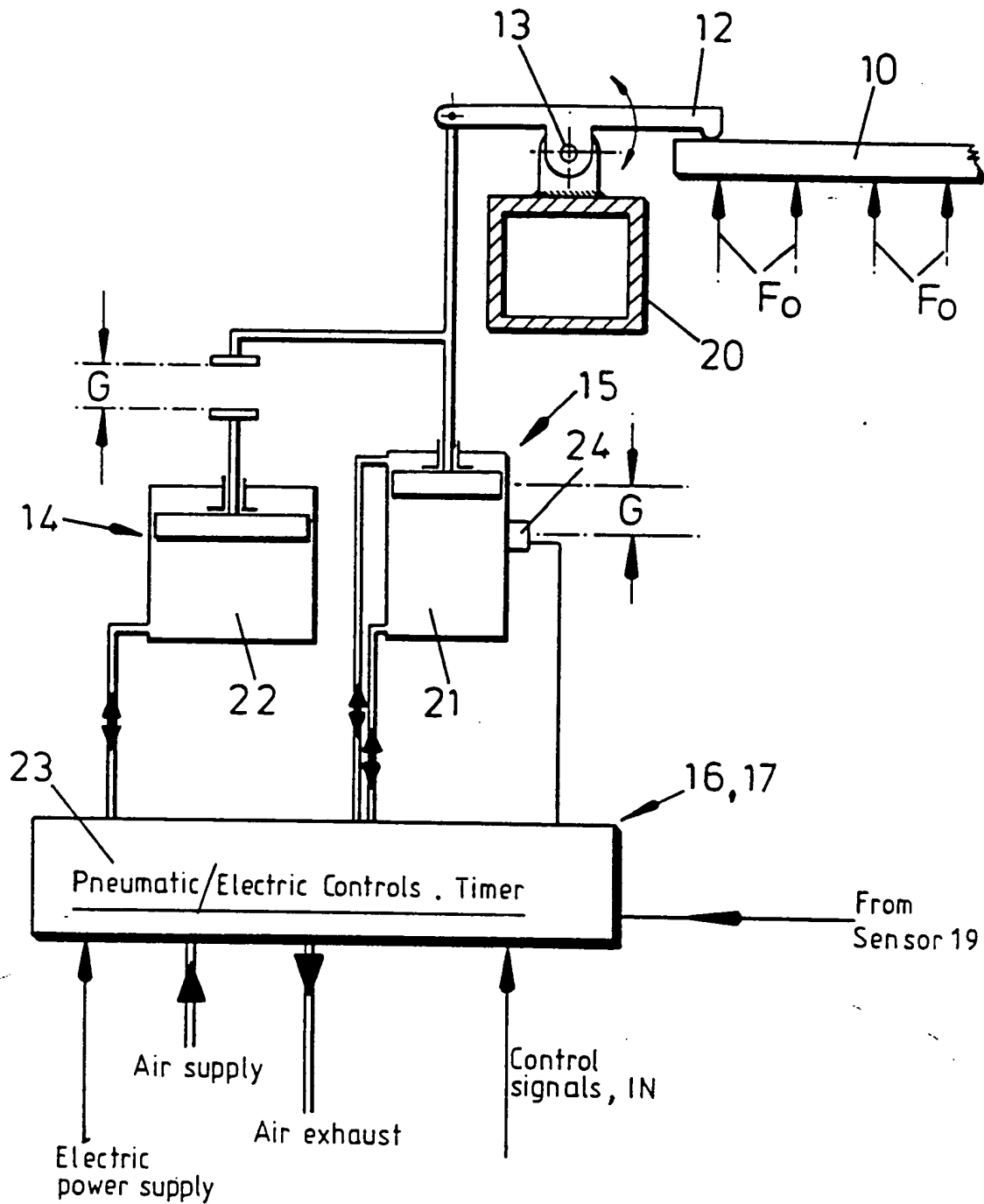
4. A releasable barrier (10) in combination with a release mechanism according to any one of claims 1 to 3.

5. A releasable barrier (10) according to claim 4 mounted to swing on an upright pivot axis (11) at one end of the barrier (10); characterised in that the said stop (12) is cooperable with the opposite end of the barrier (10).

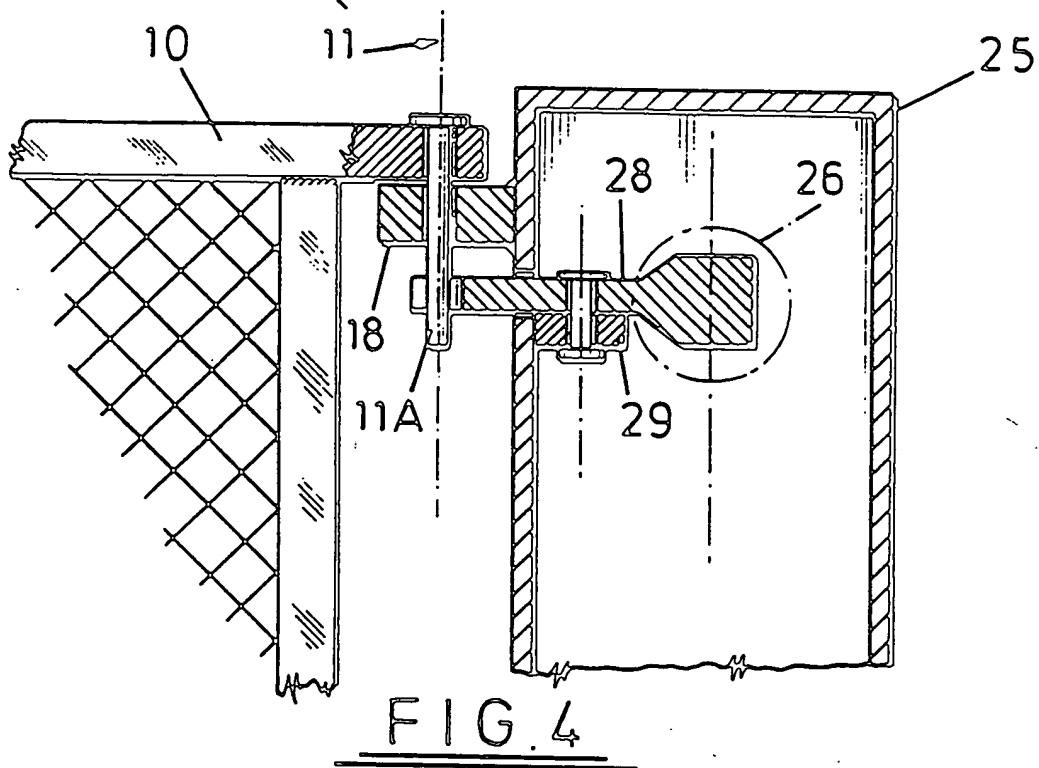
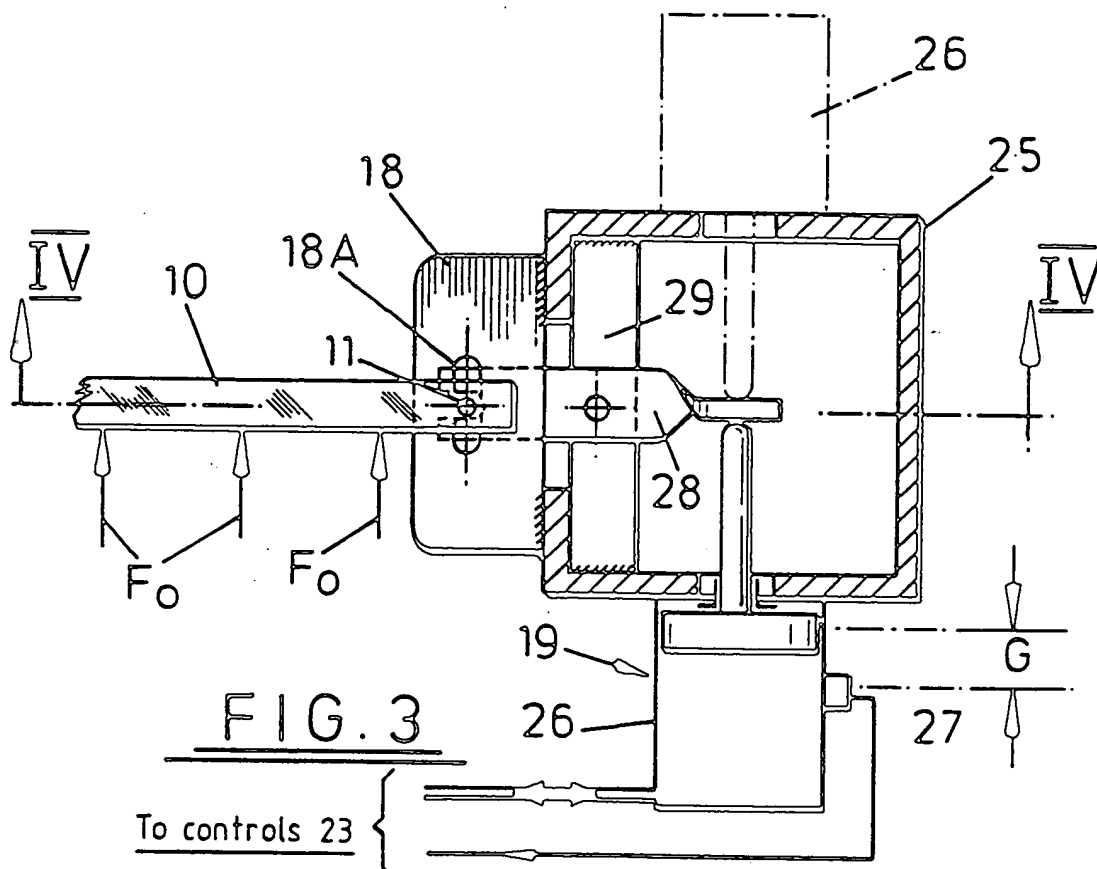
6. A releasable barrier (10) according to claim 4 or 5; characterised in that the said sensing means comprises force sensors (15, 19) one at each end of the barrier (10).

7. A releasable barrier according to claim 6;
characterised in that said one end of the barrier (10) is
capable of limited yielding movement in the direction (B)
of force tending to open the barrier (10).

1 / 3FIG. 1

2 / 3FIG. 2

3 / 3



I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all)⁶

According to International Patent Classification (IPC) or to both National Classification and IPC

Int.Cl. 5 E01F15/00; E06B11/00; E05B65/10

II. FIELDS SEARCHEDMinimum Documentation Searched⁷

Classification System

Classification Symbols

Int.Cl. 5

E01F ;

E06B ;

E05B

Documentation Searched other than Minimum Documentation
to the Extent that such Documents are Included in the Fields Searched⁸**III. DOCUMENTS CONSIDERED TO BE RELEVANT⁹**

Category ¹⁰	Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No. ¹³
X	EP,A,0 423 016 (A. LE MARCHAND) 17 April 1991	1,4
A	see page 7, line 36 - page 8, line 30; figures	5,6
P,X	GB,A,2 239 272 (SOLTREPAC) 26 June 1991 cited in the application see page 6, line 11 - line 22 see page 7, line 6 - line 15 see page 8, line 7 - line 16; figures 9-11	1,4,10

¹⁰ Special categories of cited documents:

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search

05 OCTOBER 1992

Date of Mailing of this International Search Report

19. 10. 92

International Searching Authority

EUROPEAN PATENT OFFICE

Signature of Authorized Officer

VERVEER D.

ANNEX TO THE INTERNATIONAL SEARCH REPORT
ON INTERNATIONAL PATENT APPLICATION NO. GB 9201113
SA 60987

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information. 05/10/92

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP-A-0423016	17-04-91	FR-A- 2652854	12-04-91
		WO-A- 9105934	02-05-91

GB-A-2239272	26-06-91	None	
